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ABSTRACT

Teachers must strive to enhance their power as educational connoisseurs and critics, professionals who understand how to use technological learning materials that promote growth across multiple intelligences. This case study demonstrates how this demand was met in an "Advanced" Grade 10 English class at Hillcrest High School in Ottawa, Canada. The project came to be known as the MILT.CEU assignment: "MILT" stands for Harvard Professor Howard Gardner's multiple intelligences learning theory and CEU was taken from the title of the computer-based learning materials Cloze Encounters Unlimited. Cloze Encounters is, in its simplest form, DOS (Disk Operating System) software that allows students to work individually or in teams to create puzzles for other students to do. The assignment consisted of designing a puzzle that could be carried out in each of seven traditional subject domains: language arts, global studies, history, science, mathematics, practical arts, and fine arts. Within each of these subject domains, the tasks were shaped to suit learning-style preferences including verbal linguistic, logical mathematical, visual spacial, body kinesthetic, musical rhythmic, interpersonal, intrapersonal. The MILT.CEU assignment met Gardner's demands for a responsive, integrated, substantive, cooperative curriculum in which students were called upon to function as active participants in the learning process. The teacher's role is manageable, responsive, and dynamic. (AEF)

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Beyond Traditional Boundaries: Coping With Multiple Intelligences in Today's Classrooms

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Abstract

Many well-intentioned teachers are working hard to teach children who fail to learn. Teachers must strive to enhance their power as educational connoisseurs and critics, professionals who understand how to use technological learning materials that carry learning beyond traditional classroom boundaries in order to promote growth across multiple intelligences. This case study demonstrates how this demand was met in a classroom in Ottawa, Canada.

From Theory

Many well-intentioned teachers are working hard to teach kids who fail to learn. That's not to be unexpected according to Howard Gardner, Professor at the Harvard Graduate School of Education and a Researcher at the Boston Veterans Administration Medical Centre. In his book, The Unschooled Mind: How Children Think and How Schools Should Teach, Gardner describes how ill-suited our minds and natural patterns of learning are to current educational materials, practices, and institutions.

Gardner explains that as disciplines proliferate and the burdens imposed upon the school increase, pressures mount to become accountable in determining student progress. Yet how is this to be done when secular schools are charged with the demanding cognitive responsibilities of presenting three kinds of knowledge across the disciplines. These knowledge forms Gardner identifies as "notational sophistication" or the mastery of written language and written numerical systems; "concepts

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within disciplines" or accumulation of a cluster of important concepts, frameworks, key ideas, and examples; and "forms of exposition and reasoning within disciplines" or the process of collecting evidence and reaching conclusions, an event that varies across disciplines.

Within this three-fold framework of educational responsibility lies the added burden of providing opportunities to learn to students whose abilities span seven forms of human intelligence. These forms, according to Gardner, suggest that as individuals, we are able to come to know the world (to learn) through language, logical-mathematical analysis, spacial representation, musical thinking, the use of the body to solve problems or make things, an understanding of other individuals, and an understanding of ourselves. Gardner notes that concurrent with responding to this complexity of cognitive demands and learning-style preferences, teachers are faced with numerous other social and physical limitations within any given educational environment. Being an effective teacher in any classroom is a supreme challenge.

To Practice

However, with educational restructuring and the introduction of technology into classrooms across the nation, many teachers have seized the opportunity of shifting the responsibility for learning in a manner that has led to the empowerment of learners at all levels. One such powerful learning experience, both for the teacher and the learners involved, took place at Hillcrest High School, Ottawa Board of Education. Within this setting, an "Advanced" Grade 10 English class took charge of their own learning in a manner that carried them into managing the complexities addressed by Gardner in a productive enjoyable manner. Within the context of their encounters, the students and their teacher explored language as communication (both English and French), and the content of traditional subjects such as global studies, history, science, computer technology, elementary language arts, food preparation, and music.

What follows is a description of that extraordinary curricular experience. Once described, links with Gardner's demands for a responsive, integrated, substantive, cooperative curriculum will be considered. How the Hillcrest experience addressed the needs and interests of intuitive learners (or natural, naive, or universal learners), traditional students (or scholastic learners), and disciplinary experts (or skilled learners) will be identified. Finally, the nature of the demands on the teacher within this particular pedagogical framework will be dicussed.

The learning task about to be described followed on the heels of having taught the novel Flowers for Algernon. Within that unit of study, reflecting upon the progress of Charly as he changed from being regarded as a mentally retarded young man to an intellectual genius, the Grade 10 students exhibited considerable curiosity about how we learn. Their interest sparked the design of what came to be known as the MILT.CEU assignment.

The acronym MILT was taken from Gardner's work, "multiple intelligences learning theory"; CEU was taken from the title of the computer-based learning materials Cloze Encounters Unlimited. An article in the Phi Delta Kappa Educational Foundation's PDK Fastback Series (Document #342) summarized Gardner's theory into a "multiple intelligences lessson ideas matrix". That matrix was then linked by the teacher to the power and potential of Cloze Encounters which, in its simplest form, is DOS software that allows students to work individually or in teams to create puzzles for other students to do. Within Cloze Encounters, three kinds of puzzles can be created. Within the assignment, students were free to choose which kind of puzzle they wanted to create.

The students in the class were already familiar with Cloze Encounters, having used it earlier in the year in their creative writing assignments and also in conjunction with the Shakespearean play that they had studied. It then became the teacher's responsibility to introduce new learning opportunites from an integrated, multiple intelligences perspective.

Each of the students was given a nine-page handout. The first page outlined the nature of the assignment—to be creative in designing a Cloze Encounters puzzle on any topic. The second page was a puzzle planning form. The remaining seven pages identified examples of approaches to creating Cloze Encounters puzzles that could be carried out in each of seven traditional subject domains: language arts, global studies, history, science, mathematics, practical arts, and fine arts. Within each of these subject domains, the tasks were shaped to suit learning-style preferences including verbal linguistic, logical mathematical, visual spacial, body kinesthetic, musical rhythmic, interpersonal, intrapersonal. Consequently, within the context of an explicit license to be creative, forty-two possible task designs were offered to the students. The following chart provides some examples of the sorts of choices that were included:

> Verbal Linguistic/Language Arts—Write a modern-day sequel to an excerpt from classical literature. Make the ending of that sequel the basis of a Cloze Encounters puzzle. Read the beginning of your sequel to your classmates; invite them to reconstruct the ending.

Logical Mathematical/Science—Create a puzzle that outlines the steps in the scientific method. Invite classmates to do your puzzle.

Visual Spacial/History—Create a bulletin board display that tells the story of a particular period in history. Make the content of your display clues to a puzzle that describes that period. Present your bulletin board to your classmates; then invite them to solve your puzzle.

Body Kinesthetic/Global Studies—Demonstrate a game that is popular in another culture. Invite your audience to do a puzzle based on your demonstration.

Musical Rhythmic/Practical Arts—Use culture-specific music to complement your cullinary talents as you introduce a particular culture through its food. Make a recipe for an exotic dish the basis for a puzzle. Allow classmates to sample your cooking and then invite them to solve the puzzle that you created as they listen to the music you selected.

Interpersonal/Mathematics—Use a Cloze Encounters puzzle to review mathematical processes. Weave precise explanations and formulae into your puzzle. In preparation for an upcoming test, invite classmates to do the puzzle that you created.

Intrapersonal/Fine Arts—Make a reflection on personal tastes in art, music, dance, or drama the substance of a puzzle. Delete key words that identify your preferences. Invite a close friend to do your puzzle as you observe the puzzle-solving process.

Within the context of creating Cloze Encounters puzzles, there are a number of areas where students are provided with an opportunity to be creative. Not the least of these includes the chance to write a stimulating text as the basis for the puzzle, the chance to design thought-provoking verbal, graphic or concrete clues for words that come to be hidden in the puzzle, and the chance to orchestrate a dynamic introduction to the puzzle. In rising to embrace these opportunities, the Grade 10 students at Hillcrest did what their teacher considered an outstanding job. The diversity of puzzle design and the originality of thought in presentation of the puzzles provided all involved with a worthwhile series of stimulating and enjoyable learning experiences. What follows are examples of the Hillcrest students' Cloze Encounters presentations:

- Visual Spacial/History: Costume Design Through Time—Clues to missing words were provided through colourful labelled drawings on cards. Missing words referred to subject-specific jargon such as "hoops" and "bustles".The creative text that was the basis for the puzzle involved a young woman's trip in a time machine.
- Logical Mathematical/Verbal Linguistic/Computer Science: An Introduction to Lotus 1, 2, 3—A practical demonstration of the functionality and use of the computer software contained the clues to solve the puzzle.
- Fine Arts/Interpersonal/Language Arts: A Love Poem—Two students selected a poem about a mother's love. They interpreted the poem in the form of a dance which became clues to words hidden in the puzzle.
- Verbal Linguistic/Practical Arts: A Lebanese Recipe—A taste of "taboulli" provided substance for analysis as students set out to discover the missing ingredients in a Lebanese recipe.
- Musical Rhythmic/Global Studies: The Montagnais Indians—An oral and videotaped presentation placed this aboriginal group in a cultural context. The substance of the lecture by the students and the videotape became stimuli to solving the puzzle.
- Interpersonal/History/Visual Spacial: The Halifax Explosion—This content-rich puzzle, introduced as a story, was supported solely by graphic clues, some of which were clipped from magazines, some hand-drawn, and some drawn using a graphics editor.
- Body Kinesthetic/Verbal Linguistic: A Science Experiment—Magnetic Forces—A demonstration of the effect of magnetic forces on iron filings formed the substance of this puzzle.
- Interpersonal/Intrapersonal/Practical Arts: Waffles—At once a "getting-to-know-myself" and "getting-to-know you" activity, this puzzle design revolved around getting organized to make and serve waffles.

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- Musical Rhythmic/Interpersonal: Biographical Sketch of a Popular Rock Group—Collectors' cards, charades, and an audio tape provided clues to solving a "fun puzzle" on The New Kids on Block.

- Visual Spacial/Musical Rhythmic/Interpersonal/Global Studies: Comparing Our Roots in Greek and Ukrainian Cultures—Concrete clues (e.g., coins from several countries to represent the word "currency"), pictures, and music provided clues to hidden words in a text that emerged after two students interviewed each other.

- Visual Spacial/Verbal Linguistic/Language Arts/Science: Dr. Seuss Puzzle Designed for Grade 2-3 French Immersion Students—This creative effort came to be shared with students from the neighbouring elementary school, After reading aloud the beginning of an "environmental" Dr. Seuss story, puzzle creators introduced a mural they had drawn. The mural and the story that the students had listened to, along with a variety of English and French clues that had been created in Cloze Encounters, became clues for reconstructing the ending of the story that was presented as a puzzle.

Vitreous Reflection

How did what happened in this Cloze Encounters classroom reflect the substance of Gardner's demands for a responsive, integrated, substantive, cooperative curriculum? How did the MILT.ŒU assignment address the needs and interests of the Hillcrest students? What was the teacher's role in this educational context? Observations relevant to these questions will now be considered.

1. Choice in Subject Matter—First, there is no doubt that the Hillcrest students seized the opportunity to become involved in a wide range of traditional subject preferences within the context of this integrated English task The element of choice in content focus within the MILT.ŒU assignment was seen as significant in revealing a great deal about the students' interests.

2. Choice in Mode of Communication—How students chose to express themselves, to communicate meaning, revealed a great deal about what they believed to be their communicative strengths. Performance within these choices varied considerably, and made apparent how a teacher should direct her efforts in helping students to improve their expressive skills.

3. The Kinds of Knowledge Pursued—While engaged in creating a puzzle within a particular discipline, students were constantly involved with language as communication. Throughout the puzzle-creation and solving processes, they were actively involved in listening, speaking, reading, and writing. Not only did they strive to make sense of what would become the substance of their puzzle in order to shape that content for their particular purpose, but they were also called upon to consider how others would interpret what they wrote or represented graphically, whether it was the passage itself or the clues to words that were hidden in the puzzle. Because of this "going public" dimension of the activity, there was an intensity of purpose connected with clarifying understandings and making meaning clear.

Within the communicative choices made, and within the language used to express understandings related to the content, it became possible for the observant teacher, as an educational connoisseur and critic (Eisner, 1977), to peer through the cognitive windows that opened as students set about actively shaping their Cloze Encounters puzzles. Where understanding appeared to be lacking, the teacher was provided with the opportunity of responding to the challenge. Conferencing with individuals or small groups became an important teacher responsibility. If the content of a passage that was the basis for a puzzle was unclear, then there was room for questions to be asked. If the wording of a verbal clue was ambiguous or grammatically inaccurate, a teachable moment became apparent.

4. Working Relationships—The opportunity to work at designing a Cloze Encounters puzzle as an individual or in a small team of two or three people also reached toward meeting individual learning-style preferences. Students who preferred to work "solo" in the puzzle-creation process were granted that chance, although when it came time to do the puzzle, the balance of interactive demands was restored since involvement with others was a given.

Students who were naturally "social" and enjoyed ongoing interaction with others from the outset still had the individual responsibility of completing a learning journal after others had worked to solve the puzzle that they created. Through the process of writing the learning journal, new understandings were articulated as students reflected on what was observed as others strove to interpret clues and solve puzzles that they were presented with. Observation of their peers' search for meaning, while knowing the answers, gave puzzle creators the chance to review their communicative decisions and to see how they came to be interpreted:

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- Did the puzzle challenge the puzzle solvers?
- Did any of the clues mislead them?
- Were the puzzle solvers frustrated?
- What essential background knowledge appeared to be missing?
- Did puzzle solvers stray close to a correct response but quit before reaching it?
- What assumptions did the puzzle solvers make that interfered with the communicative or puzzle-solving process?

This reflective opportunity proved to be significant in the Hillcrest learning experience.

5. Expectations and The Assumption of Responsibility—The MILT.ŒU task structure allowed for learners to self-direct tasks within the puzzle-creation process, and for leaders to emerge. In this regard, it became important for the teacher to explicitly set expectations related to the development of learner autonomy, and then to withdraw somewhat, allowing time for students to take charge. It became the teacher's responsibility to schedule a certain number of classroom periods for students to engage in puzzle creation, and to inform them that this time was to be used effectively. What "effective time management" meant was also explicitly outlined.

In the cooperative forum, in addition to having emergent confusion and misunderstandings addressed by the teacher, new understandings came to be cultivated through interaction with classmates who shared the responsibility for designing "a challenging but not frustrating puzzle". The value of formative feedback was emphasized by the teacher and students were encouraged to test out ideas on each other.

By observing the nature of social interaction that became apparent in the teamwork situations, additional information about students' attitudes and abilities became apparent. For example, a student's unwillingness to challenge another student's inaccurate interpretation of a clue presented the teacher with an opportunity to discuss how a classmate's idea could be refuted tactfully. Another student's inability to get down to task and share the workload with team members led to a discussion of the concepts of maturity and commitment. Examples of how both qualities could be demonstrated emerged. A third student's inability to sequence fundamental procedures necessary for successful puzzle completion led to intervention and the introduction of strategies intended to facilitate effective planning. In cases such as these, the teacher was repeatedly presented with the chance to clarify expectations and customize facilitation procedures with regard to work and study habits and general classroom behavior. In addition, it became possible to evaluate the degree to which students responded to expectations that were made explicit.

6. Learning Materials/Task Design—Because of the technical stability and multi-directional functionality of the software itself, Gardner's "intuitive or naive learners" were able to approach the puzzle-creation task to a considerable extent in an heuristic manner that did not require strict adherence to top-down procedures dictated by a teacher. Success came to be guaranteed through ongoing built-in opportunities to review and revise what had been created to date.

At the same time, it became the teacher's job to generally outline procedures, establish timeline expectations, and conference with individuals or teams over particular puzzle designs. To facilitate this management task, the teacher designed a "puzzle proposal form" that had students outline the focus of their puzzle, (subject matter and learning-style), list the resources that they planned to use, and describe what they would do from a procedural perspective, complete with timelines. These forms simplified the process of delivering approval of student plans and scheduling final puzzle presentations.

The open-endedness of the materials' and task design also catered to what Gardner calls "traditional scholastic students" and "disciplinary experts". As were the intuitive learners, these higher-ability students were provided with opportunities to shape the creative challenge in whatever way and to whatever level of perfection they chose. This open-endedness was important since that particular Grade 10 class that included students in the 99th percentile in city-wide testing, as well as students with communication gaps and learning disabilities.

Within this mixed group, student plans involved them in gathering, setting up and operating a variety of resources, media and equipment. It involved them in managing time effectively. In other words, the learning opportunity provided students at all levels with chances to take charge of their own learning, to engage in the higher order thinking skills of predicting, planning, checking, monitoring, and carrying an idea from concept to product. Within the task structure, all students worked toward becoming autonomous learners.

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7. Approach to Evaluation—Because it was possible for puzzle designs to vary considerably, negotiating and clarifying consistent evaluation criteria with the students became another important teacher responsibility. In essence, it was determined that the following four parts of the MILT.CEU assignment were open to evaluation:

- the completeness and usefulness of the written plan;
- the manner in which students worked to create the puzzle;
- the quality of the text on which the puzzle was based
- the clues that were created for missing words;
- the effectiveness of the presentation of the puzzle to others who would work to solve it.

Within each of these areas, evaluation criteria were established, and systems for tracking/measuring performance were set up. Sometimes what was evaluated was a product; at other times, a process.

To some extent, the teacher relinquished absolute control of the evaluation process by allowing for both self- and peer evaluation to become part of the approach. For example, students self-evaluated their puzzles by writing a one-page learning journal after they had had the opportunity to observe others try to solve the puzzle that they had created. In that journal, students described what they had observed that they did not expect to see, and explained what they would change about the puzzle if they had it to do over. From a peer's perspective, students described what they most enjoyed about a particular presentation and puzzle, and decscribed how they thought both could be improved. In both cases, anecdotal comments were written and then holistically, the students assigned themselves a grade from "A+" to "C-".

Because of the scope and variety of evaluative techniques employed within the context of the MILT.CEU assignment, and because of the ongoing opportunities for getting feedback from the teacher and peers, even the weakest student's chances of success were assured. Only a student who was frequently absent or who came to the task with a totally uncooperative attitude (and there were none in this class) would not have completed the assignment in the time given.

Conclusion

It is apparent then, that within the MILT.CEU assignment, a considerable effort was made to respond to Gardner's demands for a responsive, integrated, substantive, cooperative curriculum that strove to enrich the level of understanding acquired by students. This was done in a technological milieu that provided for a great deal of choice and negotiation within a wide range of subject areas. Students were called upon to function as active responsible participants in the learning process. Their efforts were evaluated over a broad-based evaluation scheme. The teacher's role, though different from traditional expectations associated with "egg-crate classrooms" where teachers inform quiet students about what they should know, is manageable, responsive, and dynamic. It is also empowering.

The software package that provided the opportunities for the teacher to shape such a milieu proved to be equally empowering. Not only did it empower the teacher to design learning tasks that addressed a wide range if curricular complexity, but it also called upon the the teacher to actively reflect on how learning could be facilitated when the students were self-directing much of the learning process. To a considerable extent, the materials' design created a forum that promoted professional growth.

There is a great deal more that could be discussed relevant to the Hillcrest MILT.CEU assignment and how it formed an energetic response to Gardner's demands for educational change. However, it is felt that through this paper, a stimulus for discussion has been created, and the emergence of that stimulus is an adequate response at this point in time. The author would be pleased to hear from interested readers and to discuss the concepts presented here in greater detail. Now, however, closure will be brought to the description of this particular attempt at curriculum innovation.

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Additional information on Cloze Encounters Unlimited™ (or the French language adaptation, Cache-cache™) DOS platform.can be obtained from Technolinks™ Incorporated, 273 Stewart Street, Ottawa, Canada K1N 6K3 Telephone (613) 789-6716

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